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EXAMINER	
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ART UNIT	PAPER NUMBER
2123	6

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/625,578	SMITH ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 July 2000.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-36 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-36 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 25 July 2000 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Introduction

1. Claims 1-36 of the application have been examined.

Information Disclosure Statement

2. Acknowledgment is made of the information disclosure statements filed on August 16, 2001 together with copies of the patents and papers. The patents and papers have been considered in reviewing the claims.

Drawings

3. The drawings submitted on July 25, 2000 are accepted.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 2, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), and further in view of **Hanf et al. (HA)** (U.S. Patent 6,438,462).

5.1 **AN** teaches system and method for determining the desired decoupling components for power distribution systems using a computer system. Specifically as per Claim 1, **AN** teaches a system for determining decoupling components for a power distribution system (Abstract, L1-3; CL4, L22-25); the system comprising:

a database of characteristic values for a plurality of decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841); and

a computer system configured to:

access the database of characteristic values for the plurality of decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841);

accept known system parameters for the power distribution system (Fig. 8B, Blk 806; CL18, L33-44);

select one or more different decoupling components based on the known system parameters for the power distribution system and entries in the database (CL4, L66 to CL5, L5; CL5, L25-33; Fig. 8B, Blks 860, 807, 822, 841);

calculate a specific quantity for selected decoupling components, the selected decoupling components selected from the database based on known system parameters (CL5, L41-61; CL6, L21-40; Fig. 8B, Blks 860, 807, 822, 841; Fig 5, Blk 520); and

determine a location of placement within the power distribution system for each of the selected decoupling components based on the known system parameters and the entries in the database (Fig 8B, Blk 823; Fig 5, Blk 540-555; CL6, L51 to CL7, L26).

AN does not expressly teach the power distribution system including a voltage regulator module. **PE** teaches the power distribution system including a voltage regulator module (Fig 2; CL7, L11-30; CL8, L4-13; CL8, L65-68; CL9, L33-40, L61-65; CL12, L33 to CL13, L15; CL13, L32-48; Fig 6), as the voltage regulation stabilizes the output voltage to within allowable tolerance (CL8, L10-12; CL12, L59-64). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN** with the system of **PE** that included the power distribution system including a voltage regulator module, as the voltage regulation would stabilize the output voltage to within allowable tolerance.

AN does not expressly teach simulating a voltage regulator circuit using a mathematical model of the voltage regulator circuit, wherein simulating the voltage regulator circuit includes simulating a voltage with a voltage source model; simulating ramping up or ramping down of current in the voltage regulator circuit; and simulating effects of output inductance on the voltage

regulator circuit with a model of an output inductor. **PE** teaches simulating a voltage regulator circuit using a mathematical model of the voltage regulator circuit, wherein simulating the voltage regulator circuit includes simulating a voltage with a voltage source model; simulating ramping up or ramping down of current in the voltage regulator circuit; and simulating effects of output inductance on the voltage regulator circuit with a model of an output inductor (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the voltage and the effects of the output impedance on voltage allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN** with the system of **PE** that included simulating a voltage regulator circuit using a mathematical model of the voltage regulator circuit, wherein simulating the voltage regulator circuit included simulating a voltage with a voltage source model; simulating ramping up or ramping down of current in the voltage regulator circuit; and simulating effects of output inductance on the voltage regulator circuit with a model of an output inductor, as simulating the voltage and the effects of the output impedance on voltage would allow identification of the transient response of the voltage regulator under various conditions.

AN and **PE** do not expressly teach simulating ramping up or ramping down of current in the voltage regulator circuit with a model of a slew inductor. **HA** teaches simulating ramping up or ramping down of current in the voltage regulator circuit with a model of a slew inductor (CL17, L51 to CL18, L29), as by control of slew rate, radio frequency interference signal suppression can be directly influenced (CL18, L12-15). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN** and **PE**

with the system of **HA** that included simulating ramping up or ramping down of current in the voltage regulator circuit with a model of a slew inductor, as by control of slew rate, radio frequency interference signal suppression could be directly influenced.

As per Claim 2, **AN** teaches that the decoupling components are capacitors, and wherein characteristics of each of the capacitors includes a rated capacitance value, a mounted inductance value, and an equivalent series resistance (ESR) value (CL5, L26-29).

5.3 As per Claim 25, **AN** teaches a system for determining decoupling components for a power distribution system (Abstract, L1-3; CL4, L22-25); the system comprising:

a database of characteristic values for a plurality of decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841); and

a computer system configured to:

access the database of characteristic values for the plurality of decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841);

accept known system parameters for the power distribution system (Fig. 8B, Blk 806; CL18, L33-44);

select one or more different decoupling components based on the known system parameters for the power distribution system and entries in the database (CL4, L66 to CL5, L5; CL5, L25-33; Fig. 8B, Blks 860, 807, 822, 841);

calculate a specific quantity for selected decoupling components, the selected decoupling components selected from the database based on known system parameters (CL5, L41-61; CL6, L21-40; Fig. 8B, Blks 860, 807, 822, 841; Fig 5, Blk 520); and

determine a location of placement within the power distribution system for each of the selected decoupling components based on the known system parameters and the entries in the database (Fig 8B, Blk 823; Fig 5, Blk 540-555; CL6, L51 to CL7, L26).

AN teaches simulating power distribution circuit using a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN** does not expressly teach simulating a voltage regulator circuit using a SPICE model of the voltage regulator circuit. **PE** teaches simulating voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the voltage regulator circuit allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the SPICE model simulation of **AN** with the voltage regulator circuit simulation of **PE**, as simulating the voltage regulator circuit using a SPICE model would allow identification of the transient response of the voltage regulator under various conditions.

AN teaches simulating power distribution circuit using a SPICE model; and simulating a voltage with a SPICE model of a voltage source (CL18, L5-13; Fig 8A, Blk 860, 865). **AN** does not expressly teach simulating ramping up or ramping down of current in the voltage regulator circuit with a SPICE model of a slew inductor; and simulating effects of output inductance on the voltage regulator circuit with a SPICE model of an output inductor. **PE** teaches simulating

ramping up or ramping down of current in the voltage regulator circuit; and simulating effects of output inductance on the voltage regulator circuit with a model of an output inductor (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the voltage and the effects of the output impedance on voltage allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the simulating power distribution circuit using a SPICE model; and simulating a voltage with a SPICE model of a voltage source of **AN** with the system of **PE** that included simulating ramping up or ramping down of current in the voltage regulator circuit; and simulating effects of output inductance on the voltage regulator circuit with a model of an output inductor, as simulating the voltage and the effects of the output impedance on voltage would allow identification of the transient response of the voltage regulator under various conditions.

AN teaches simulating power distribution circuit using a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN** and **PE** do not expressly teach simulating ramping up or ramping down of current in the voltage regulator circuit with a SPICE model of a slew inductor. **HA** teaches simulating ramping up or ramping down of current in the voltage regulator circuit with a model of a slew inductor (CL17, L51 to CL18, L29), as by control of slew rate, radio frequency interference signal suppression can be directly influenced (CL18, L12-15). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the simulating power distribution circuit using a SPICE model of **AN** and **PE** with the system of **HA** that included simulating ramping up or ramping down of current in the voltage regulator circuit

with a model of a slew inductor, as by control of slew rate, radio frequency interference signal suppression could be directly influenced.

As per Claim 26, **AN** teaches that the decoupling components are capacitors, and wherein characteristics of each of the capacitors includes a rated capacitance value, a mounted inductance value, and an equivalent series resistance (ESR) value (CL5, L26-29).

6. Claims 3, 6-8, 11, 12, 17-19, 27, 30-32, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), and **Hanf et al. (HA)** (U.S. Patent 6,438,462), and further in view of **Brown (BR)** (U.S. Patent 5,960,207) and **Chan (CH)** (U.S. Patent 6,466,898).

6.1 As per Claim 3, **AN, PE** and **HA** teach the system of claim 2. **AN, PE** and **HA** do not expressly teach that the computer system is further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation. **BR** teaches that the computer system is further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation (CL6, L14-21), as the output voltage and the amount of filtering are set by the value of the bulk capacitance in relation to load current and the bulk capacitance decreases the voltage ripple (CL6, L16-21). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE** and **HA** with the system of **BR** that

included the computer system further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation, as the output voltage and the amount of filtering would be set by the value of the bulk capacitance in relation to load current and the bulk capacitance would decrease the voltage ripple.

AN, PE, HA and **BR** do not expressly teach that the computer system is further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprises simulating the operation of the power distribution system over a plurality of clock cycles. **CH** teaches that the computer system is further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprises simulating the operation of the power distribution system over a plurality of clock cycles (CL1, L64-67; Fig 4; Fig 9; CL7, L47-52), as cycle based simulation allows trading off accuracy with speed and reduce design verification time (CL1, L64-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA** and **BR** with the system of **CH** that included the computer system further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprised simulating the operation of the power distribution system over a plurality of clock cycles, as cycle based simulation would allow trading off accuracy with speed and reduce design verification time.

6.2 As per Claim 6, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN, HA, BR** and **CH** do not expressly teach that the computer system is configured to simulate an output

resistor of the voltage regulator circuit, wherein simulating the output resistor simulates effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit. **PE** teaches that the computer system is configured to simulate an output resistor of the voltage regulator circuit, wherein simulating the output resistor simulates effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included computer system configured to simulate an output resistor of the voltage regulator circuit, wherein simulating the output resistor simulated effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit, as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit would allow identification of the transient response of the voltage regulator under various conditions.

6.3 As per Claim 7, **AN, PE, HA, BR** and **CH** teach the system of claim 6. **AN, HA, BR** and **CH** do not expressly teach that the computer system is configured to simulate the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor. **PE** teaches that the computer system is configured to simulate the effects of

equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included computer system configured to simulate the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor, as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor would allow identification of the transient response of the voltage regulator under various conditions.

6.4 As per Claim 8, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN** also teaches the known system parameters for the power distribution system (CL18, L33-41); comprising one or more of the following:

one or more power supply characteristics (Cl18, L35-41);

allowable voltage ripple (CL18, L35-36);

total current consumption (CL18, L36);

physical location constraints (CL18, L38-39);

weighting factors (CL18, L45-46; CL10, L41-53); or

a frequency range for a target impedance of the power distribution system (CL18, L41; CL5, L6-15).

AN, HA, BR and **CH** do not expressly teach that the known system parameters for the power distribution system comprise load characteristics and one or more voltage regulator circuit characteristics. **PE** teaches that the known system parameters for the power distribution system comprise load characteristics and one or more voltage regulator circuit characteristics (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating load characteristics and one or more voltage regulator circuit characteristics allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included the known system parameters for the power distribution system comprising load characteristics and one or more voltage regulator circuit characteristics, as simulating load characteristics and one or more voltage regulator circuit characteristics would allow identification of the transient response of the voltage regulator under various conditions.

6.5 As per Claim 11, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN** also teaches that the system is further configured to calculate one or more electrical characteristic values at one or more specified physical locations within the power distribution system (Abstract, L20-24; CL6, L8-14).

6.6 As per Claim 12, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN** also teaches that the system is further configured to generate a resultant bill of goods, the bill of goods including a specific quantity of each of the selected decoupling components and

information concerning location of physical placement of the selected decoupling components within the power distribution system (CL6, L17-19; CL15, L14-21).

6.7 As per Claim 17, **AN, PE, BR** and **CH** teach the method of claim 13. **AN, BR** and **CH** do not expressly teach that the model of the voltage regulator circuit is a mathematical model, wherein the mathematical model comprises a voltage source model, wherein the voltage source model is configured for simulating a voltage source for the power distribution system; and an output inductor model, wherein the output inductor model is configured for simulating effects of output inductance on the voltage regulator circuit. **PE** teaches that the model of the voltage regulator circuit is a mathematical model, wherein the mathematical model comprises a voltage source model, wherein the voltage source model is configured for simulating a voltage source for the power distribution system; and an output inductor model, wherein the output inductor model is configured for simulating effects of output inductance on the voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the voltage and the effects of the output impedance on voltage allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, BR** and **CH** with the method of **PE** that included the model of the voltage regulator circuit being a mathematical model, wherein the mathematical model comprised a voltage source model, wherein the voltage source model was configured for simulating a voltage source for the power distribution system; and an output inductor model, wherein the output inductor model was configured for simulating effects of output inductance on the voltage regulator circuit, as

simulating the voltage and the effects of the output impedance on voltage would allow identification of the transient response of the voltage regulator under various conditions.

AN, BR, CH and **PE** do not expressly teach a slew inductor model, wherein the slew inductor model is configured for simulating a ramping up or a ramping down of current in the voltage regulator circuit. **HA** teaches a slew inductor model, wherein the slew inductor model is configured for simulating a ramping up or a ramping down of current in the voltage regulator circuit (CL17, L51 to CL18, L29), as by control of slew rate, radio frequency interference signal suppression can be directly influenced (CL18, L12-15). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, BR, CH** and **PE** with the method of **HA** that included a slew inductor model, wherein the slew inductor model was configured for simulating a ramping up or a ramping down of current in the voltage regulator circuit, as by control of slew rate, radio frequency interference signal suppression could be directly influenced.

AN, HA, BR and **CH** do not expressly teach a decoupling resistor model, wherein the decoupling resistor model is configured to simulate the effects of an equivalent series resistance of a capacitor in the voltage regulator circuit. **PE** teaches a decoupling resistor model, wherein the decoupling resistor model is configured to simulate the effects of an equivalent series resistance of a capacitor in the voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to

modify the method of **AN, HA, BR** and **CH** with the method of **PE** that included a decoupling resistor model, wherein the decoupling resistor model is configured to simulate the effects of an equivalent series resistance of a capacitor in the voltage regulator circuit, as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor would allow identification of the transient response of the voltage regulator under various conditions.

AN, HA, BR and **CH** do not expressly teach an output resistor model, wherein the output resistor model is configured for simulating effects of resistance between an output of the voltage regulator circuit and the load. **PE** teaches an output resistor model, wherein the output resistor model is configured for simulating effects of resistance between an output of the voltage regulator circuit and the load (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, HA, BR** and **CH** with the method of **PE** that included an output resistor model, wherein the output resistor model is configured for simulating effects of resistance between an output of the voltage regulator circuit and the load, as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load would allow identification of the transient response of the voltage regulator under various conditions.

6.8 As per Claim 18, **AN, PE, HA, BR** and **CH** teach the method of claim 17. **AN, HA, BR** and **CH** do not expressly teach that the mathematical model of the voltage regulator circuit is a simplified model. **PE** teaches that the mathematical model of the voltage regulator circuit is a simplified model (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), because as per **CH**, simplified model of the voltage regulator reduces the design verification time (CL1, L65-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included the mathematical model of the voltage regulator circuit being a simplified model, as simplified model of the voltage regulator reduces the design verification time.

AN, PE, BR and **CH** do not expressly teach that the voltage regulator circuit is a switching voltage regulator. **HA** teaches that the voltage regulator circuit is a switching voltage regulator (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as a switching mode voltage regulator can be activated and deactivated by means of a control signal (CL5, L25-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE, BR** and **CH** with the method of **HA** that included the voltage regulator circuit being a switching voltage regulator, as a switching mode voltage regulator could be activated and deactivated by means of a control signal.

6.9 As per Claim 19, **AN, PE, HA, BR** and **CH** teach the method of claim 18. **AN** teaches that the mathematical model of the power distribution system is a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN, HA, BR** and **CH** do not expressly teach that the mathematical model of the voltage regulator circuit is a SPICE model. **PE** teaches that the mathematical

model of the voltage regulator (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the voltage regulator allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the SPICE model method of **AN** with the voltage regulator circuit method of **PE** that included that the mathematical model of the voltage regulator circuit, as simulating the voltage regulator circuit using a SPICE model would allow identification of the transient response of the voltage regulator under various conditions.

6.10 As per Claim 27, **AN, PE** and **HA** teach the system of claim 26. **AN, PE** and **HA** do not expressly teach that the computer system is further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation. **BR** teaches that the computer system is further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation (CL6, L14-21), as the output voltage and the amount of filtering are set by the value of the bulk capacitance in relation to load current and the bulk capacitance decreases the voltage ripple (CL6, L16-21). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE** and **HA** with the system of **BR** that included the computer system further configured to obtain an estimate of a bulk capacitance value for the power distribution system; and refine the bulk capacitance value based on results obtained during the cyclical simulation, as the output voltage and the amount of filtering would

be set by the value of the bulk capacitance in relation to load current and the bulk capacitance would decrease the voltage ripple.

AN, PE, HA and **BR** do not expressly teach that the computer system is further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprises simulating the operation of the power distribution system over a plurality of clock cycles. **CH** teaches that the computer system is further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprises simulating the operation of the power distribution system over a plurality of clock cycles (CL1, L64-67; Fig 4; Fig 9; CL7, L47-52), as cycle based simulation allows trading off accuracy with speed and reduce design verification time (CL1, L64-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA** and **BR** with the system of **CH** that included the computer system further configured to perform a cyclical simulation of the power distribution system, wherein the cyclical simulation comprised simulating the operation of the power distribution system over a plurality of clock cycles, as cycle based simulation would allow trading off accuracy with speed and reduce design verification time.

6.11 As per Claim 30, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN** teaches simulating power distribution circuit using a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN, HA, BR** and **CH** do not expressly teach that the computer system is configured to simulate the effects of an output resistance from a load coupled to the voltage regulator circuit using a SPICE model of an output resistor. **PE** teaches that the computer system is configured to

simulate the effects of an output resistance from a load coupled to the voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the simulating power distribution circuit using a SPICE model of **AN** with the system of **PE** that included the computer system configured to simulate the effects of an output resistance from a load coupled to the voltage regulator circuit, as simulating the output resistor and the effects of resistance between the output of the voltage regulator circuit and a load coupled to the voltage regulator circuit would allow identification of the transient response of the voltage regulator under various conditions.

6.12 As per Claim 31, **AN, PE, HA, BR** and **CH** teach the system of claim 30. **AN** teaches simulating power distribution circuit using a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN, HA, BR** and **CH** do not expressly teach that the computer system is configured to simulate the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a SPICE model of a decoupling resistor. **PE** teaches that the computer system is configured to simulate the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor allows identification of the transient

response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the simulating power distribution circuit using a SPICE model of **AN** with the system of **PE** that included computer system configured to simulate the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor, as simulating the effects of equivalent series resistance of a capacitor in the voltage regulator circuit with a model of a decoupling resistor would allow identification of the transient response of the voltage regulator under various conditions.

6.13 As per Claim 32, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN** also teaches the known system parameters for the power distribution system (CL18, L33-41); comprising one or more of the following:

one or more power supply characteristics (Cl18, L35-41);

allowable voltage ripple (CL18, L35-36);

total current consumption (CL18, L36);

physical location constraints (CL18, L38-39);

weighting factors (CL18, L45-46; CL10, L41-53); or

a frequency range for a target impedance of the power distribution system (CL18, L41; CL5, L6-15).

AN, HA, BR and **CH** do not expressly teach that the known system parameters for the power distribution system comprise load characteristics and one or more voltage regulator circuit characteristics. **PE** teaches that the known system parameters for the power distribution system

comprise load characteristics and one or more voltage regulator circuit characteristics (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating load characteristics and one or more voltage regulator circuit characteristics allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included the known system parameters for the power distribution system comprising load characteristics and one or more voltage regulator circuit characteristics, as simulating load characteristics and one or more voltage regulator circuit characteristics would allow identification of the transient response of the voltage regulator under various conditions.

6.14 As per Claim 35, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN** also teaches that the system is further configured to calculate one or more electrical characteristic values at one or more specified physical locations within the power distribution system (Abstract, L20-24; CL6, L8-14).

6.15 As per Claim 36, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN** also teaches that the system is further configured to generate a resultant bill of goods, the bill of goods including a specific quantity of each of the selected decoupling components and information concerning location of physical placement of the selected decoupling components within the power distribution system (CL6, L17-19; CL15, L14-21).

7. Claims 4, 5, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), **Hanf et al. (HA)** (U.S. Patent 6,438,462), **Brown (BR)** (U.S. Patent 5,960,207) and **Chan (CH)** (U.S. Patent 6,466,898), and further in view of **Chun (CHU)** ("investigation of voltage regulation stability of static synchronous compensator in power system", IEEE, January 2000).

7.1 As per Claim 4, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN, PE, HA, BR** and **CH** do not expressly teach that the computer system is further configured to analyze a transient response of the power distribution system during the cyclical simulation. **CHU** teaches that the computer system is further configured to analyze a transient response of the power distribution system during the cyclical simulation. (Page 2643, Fig 4 and 5; Page 2644, Fig 6 and 9; Page 2644, CL1, Para 1; Page 2645, Fig 12 and 13), as the transient response indicates the speed of response as a function of time and transient gain (Page 2644, CL2, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **CHU** that included the computer system further configured to analyze a transient response of the power distribution system during the cyclical simulation, as the transient response would indicate the speed of response as a function of time and transient gain.

7.2 As per Claim 5, **AN, PE, HA, BR, CH** and **CHU** teach the system of claim 4. **AN, PE, HA, BR** and **CH** do not expressly teach that the computer system is further configured to analyze stability of the power distribution system during the cyclical simulation. **CHU** teaches

that the computer system is further configured to analyze stability of the power distribution system during the cyclical simulation. (Page 2645, Fig 10; Page 2646, Fig 14 and 15; Page 2647, Fig 17; Page 2645,CL1, Para 1), as the power distribution system has resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage (Page 2645, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **CHU** that included the computer system further configured to analyze stability of the power distribution system during the cyclical simulation, as the power distribution system would have resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage.

7.3 As per Claim 28, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN, PE, HA, BR** and **CH** do not expressly teach that the computer system is further configured to analyze a transient response of the power distribution system during the cyclical simulation. **CHU** teaches that the computer system is further configured to analyze a transient response of the power distribution system during the cyclical simulation. (Page 2643, Fig 4 and 5; Page 2644, Fig 6 and 9; Page 2644, CL1, Para 1; Page 2645, Fig 12 and 13), as the transient response indicates the speed of response as a function of time and transient gain (Page 2644, CL2, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **CHU** that included the computer system further configured to analyze a transient response of the power distribution

system during the cyclical simulation, as the transient response would indicate the speed of response as a function of time and transient gain.

7.4 As per Claim 29, **AN, PE, HA, BR, CH** and **CHU** teach the system of claim 28. **AN, PE, HA, BR** and **CH** do not expressly teach that the computer system is further configured to analyze stability of the power distribution system during the cyclical simulation. **CHU** teaches that the computer system is further configured to analyze stability of the power distribution system during the cyclical simulation. (Page 2645, Fig 10; Page 2646, Fig 14 and 15; Page 2647, Fig 17; Page 2645,CL1, Para 1), as the power distribution system has resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage (Page 2645, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **CHU** that included the computer system further configured to analyze stability of the power distribution system during the cyclical simulation, as the power distribution system would have resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage.

8. Claims 9, 10, 20, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), **Hanf et al. (HA)** (U.S. Patent 6,438,462), **Brown (BR)** (U.S. Patent 5,960,207) and **Chan (CH)** (U.S. Patent 6,466,898), and further in view of **Schutz (SCU)** (U.S. Patent 5,444,298).

8.1 As per Claim 9, **AN, PE, HA, BR** and **CH** teach the system of claim 3. **AN, PE, HA, BR** and **CH** do not expressly teach that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical. **SC** teaches that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical (CL1, L11-15; CL2, L11-19), as the lower transistor dimensions and higher density require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption (CL1, L39-46). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **SC** that included the voltage regulator circuit configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage would not be identical, as the lower transistor dimensions and higher density would require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption.

8.2 As per Claim 10, **AN, PE, HA, BR, CH** and **SC** teach the system of claim 9. **AN, HA, BR, CH** and **SC** do not expressly teach that the mathematical model of the voltage regulator circuit is a simplified model. **PE** teaches that the mathematical model of the voltage regulator circuit is a simplified model (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), because as per **CH**, simplified model of the voltage regulator reduces the design verification time (CL1, L65-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, HA, BR, CH** and **SC** with the system of **PE**

that included the mathematical model of the voltage regulator circuit being a simplified model, as simplified model of the voltage regulator reduces the design verification time.

AN, PE, BR, CH and **SC** do not expressly teach that the voltage regulator circuit is a switching voltage regulator. **HA** teaches that the voltage regulator circuit is a switching voltage regulator (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as a switching mode voltage regulator can be activated and deactivated by means of a control signal (CL5, L25-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, BR, CH** and **SC** with the system of **HA** that included the voltage regulator circuit being a switching voltage regulator, as a switching mode voltage regulator could be activated and deactivated by means of a control signal.

8.3 As per Claim 20, **AN, PE, HA, BR** and **CH** teach the method of claim 18. **AN, PE, HA, BR** and **CH** do not expressly teach that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical. **SC** teaches that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical (CL1, L11-15; CL2, L11-19), as the lower transistor dimensions and higher density require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption (CL1, L39-46). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE, HA, BR** and **CH** with the method of **SC** that included the voltage regulator circuit configured to receive a first voltage as an input, and to output a second voltage,

wherein the first voltage and the second voltage would not be identical, as the lower transistor dimensions and higher density would require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption.

8.4 As per Claim 33, **AN, PE, HA, BR** and **CH** teach the system of claim 27. **AN, PE, HA, BR** and **CH** do not expressly teach that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical. **SC** teaches that the voltage regulator circuit is configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage are not identical (CL1, L11-15; CL2, L11-19), as the lower transistor dimensions and higher density require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption (CL1, L39-46). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, HA, BR** and **CH** with the system of **SC** that included the voltage regulator circuit configured to receive a first voltage as an input, and to output a second voltage, wherein the first voltage and the second voltage would not be identical, as the lower transistor dimensions and higher density would require lower operating voltage of approximately 3.3 volts or lower in stead of 5 volts, in order to prevent device failure and decrease power consumption.

8.5 As per Claim 34, **AN, PE, HA, BR, CH** and **SC** teach the system of claim 33. **AN** teaches simulating power distribution circuit using a SPICE model (CL18, L5-13; Fig 8A, Blk 860, 865). **AN, HA, BR, CH** and **SC** do not expressly teach that the SPICE model of the voltage

regulator circuit is a simplified model. **PE** teaches that the voltage regulator circuit is a simplified model (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), because as per **CH**, simplified model of the voltage regulator reduces the design verification time (CL1, L65-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to combine the simulating power distribution circuit using a SPICE model of **AN** with the system of **PE** that included the voltage regulator circuit being a simplified model, as simplified model of the voltage regulator reduces the design verification time.

AN, PE, BR, CH and **SC** do not expressly teach that the voltage regulator circuit is a switching voltage regulator. **HA** teaches that the voltage regulator circuit is a switching voltage regulator (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as a switching mode voltage regulator can be activated and deactivated by means of a control signal (CL5, L25-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **AN, PE, BR, CH** and **SC** with the system of **HA** that included the voltage regulator circuit being a switching voltage regulator, as a switching mode voltage regulator could be activated and deactivated by means of a control signal.

9. Claims 13, 16 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), and further in view of **Brown (BR)** (U.S. Patent 5,960,207) and **Chan (CH)** (U.S. Patent 6,466,898).

9.1 As per Claim 13, **AN** teaches a method for determining a specific quantity (CL5, L41-61; CL6, L21-40; Fig. 8B, Blks 860, 807, 822, 841; Fig 5, Blk 520) and physical location of

decoupling components within a power distribution system (Fig 8B, Blk 823; Fig 5, Blk 540-555; CL6, L51 to CL7, L26); the method comprising:

selecting decoupling components from a database, wherein the database includes characteristic values for a plurality of different decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841);

determining a target impedance for the power distribution system (CL18, L41; CL5, L6-15); and

selecting one or more of the different decoupling components based on one or more electrical characteristic values for each of the decoupling components (CL4, L66 to CL5, L5; CL5, L25-33; Abstract, L11-13; CL4, L38-45; Fig. 8B, Blks 860, 807, 822, 841).

AN does not expressly teach simulating the operation of the power distribution system, wherein the power distribution system includes a voltage regulator circuit coupled to a load. **PE** teaches simulating the operation of the power distribution system, wherein the power distribution system includes a voltage regulator circuit coupled to a load (Fig 2; CL7, L11-30; CL8, L4-13; CL8, L65-68; CL9, L33-40, L61-65; CL12, L33 to CL13, L15; CL13, L32-48; Fig 6), as the voltage regulation stabilizes the output voltage to within allowable tolerance (CL8, L10-12; CL12, L59-64) and simulating the voltage regulator allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN** with the method of **PE** that included simulating the operation of the power distribution system, wherein the power distribution system included a voltage regulator circuit

coupled to a load, as the voltage regulation would stabilize the output voltage to within allowable tolerance; and simulating the voltage regulator would allow identification of the transient response of the voltage regulator under various conditions.

AN does not expressly teach simulating the operation of the voltage regulator circuit using a model of the voltage regulator circuit. **PE** teaches simulating the operation of the voltage regulator circuit using a model of the voltage regulator circuit (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating the operation of the voltage regulator circuit using a model of the voltage regulator circuit allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN** with the method of **PE** that included simulating the operation of the voltage regulator circuit using a model of the voltage regulator circuit, as simulating the operation of the voltage regulator circuit using a model of the voltage regulator circuit would allow identification of the transient response of the voltage regulator under various conditions.

AN and **PE** do not expressly teach obtaining an estimate of a bulk capacitance value for the power distribution system; refining the bulk capacitance value based on results obtained during the cyclical simulation; and selecting one or more of the different decoupling components based on the bulk capacitance obtained during the simulating the operation of the power distribution system. **BR** teaches obtaining an estimate of a bulk capacitance value for the power distribution system; refining the bulk capacitance value based on results obtained during the cyclical simulation; and selecting one or more of the different decoupling components based on the bulk capacitance obtained during the simulating the operation of the power distribution

system (CL6, L14-21), as the output voltage and the amount of filtering are set by the value of the bulk capacitance in relation to load current and the bulk capacitance decreases the voltage ripple (CL6, L16-21). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN** and **PE** with the method of **BR** that included obtaining an estimate of a bulk capacitance value for the power distribution system; refining the bulk capacitance value based on results obtained during the cyclical simulation; and selecting one or more of the different decoupling components based on the bulk capacitance obtained during the simulating the operation of the power distribution system, as the output voltage and the amount of filtering would be set by the value of the bulk capacitance in relation to load current and the bulk capacitance would decrease the voltage ripple.

AN, PE and **BR** do not expressly teach performing a cyclical simulation of the power distribution system, wherein the. cyclical simulation includes simulating the operation of the power distribution system for a plurality of clock cycles. **CH** teaches performing a cyclical simulation of the power distribution system, wherein the. cyclical simulation includes simulating the operation of the power distribution system for a plurality of clock cycles (CL1, L64-67; Fig 4; Fig 9; CL7, L47-52), as cycle based simulation allows trading off accuracy with speed and reduce design verification time (CL1, L64-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE** and **BR** with the method of **CH** that included performing a cyclical simulation of the power distribution system, wherein the cyclical simulation includes simulating the operation of the power distribution system for a plurality of clock cycles, as cycle based simulation would allow trading off accuracy with speed and reduce design verification time.

9.2 As per Claim 16, **AN** teaches that the decoupling components are capacitors, and wherein characteristics of each of the capacitors includes a rated capacitance value, a mounted inductance value, and an equivalent series resistance (ESR) value (CL5, L26-29).

9.3 As per Claim 21, **AN, PE, HA, BR** and **CH** teach the method of claim 13. **AN** also teaches selecting the decoupling components based on known system parameters (CL18, L33-41); the known system parameters include one or more of the following:

one or more power supply characteristics (Cl18, L35-41);

allowable voltage ripple (CL18, L35-36);

total current consumption (CL18, L36);

physical location constraints (CL18, L38-39);

weighting factors (CL18, L45-46; CL10, L41-53); or

a frequency range for a target impedance of the power distribution system (CL18, L41; CL5, L6-15).

AN, HA, BR and **CH** do not expressly teach that the known system parameters include load characteristics and one or more voltage regulator circuit characteristics. **PE** teaches that the known system parameters include load characteristics and one or more voltage regulator circuit characteristics (CL12, L65 to CL13, L15; CL13, L32-48; Figs 6, 7A and 7B), as simulating load characteristics and one or more voltage regulator circuit characteristics allows identification of the transient response of the voltage regulator under various conditions (Fig 7B; CL13, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to

modify the system of **AN, HA, BR** and **CH** with the system of **PE** that included the known system parameters including load characteristics and one or more voltage regulator circuit characteristics, as simulating load characteristics and one or more voltage regulator circuit characteristics would allow identification of the transient response of the voltage regulator under various conditions.

9.4 As per Claim 22, **AN, PE, HA, BR** and **CH** teach the method of claim 21. **AN** also teaches that the system is further configured to calculate one or more electrical characteristic values at one or more specified physical locations within the power distribution system (Abstract, L20-24; CL6, L8-14).

9.5 As per Claim 23, **AN, PE, HA, BR** and **CH** teach the method of claim 22. **AN** also teaches that the system is further configured to generate a resultant bill of goods, the bill of goods including a specific quantity of each of the selected decoupling components and information concerning location of physical placement of the selected decoupling components within the power distribution system (CL6, L17-19; CL15, L14-21).

9.6 As per Claim 24, **AN, PE, BR** and **CH** teach the method of claim 23. **AN** also teaches changing the specific quantity for any of the decoupling components selected from the database (CL5, L41-61; CL6, L21-40; Fig. 8B, Blks 860, 807, 822, 841; Fig 5, Blk 520);

recalculating placement of the decoupling components at a specific location within the power distribution system (Fig 8B, Blk 823; Fig 5, Blk 540-555; CL6, L51 to CL7, L26);

the recalculating is based upon the known system parameters for the power distribution system (Fig. 8B, Blk 806; CL18, L33-44); and

electrical characteristic values for the decoupling components (Abstract, L11-13; CL4, L38-45; Fig. 8B, Blk 841).

AN, PE and **CH** do not expressly teach that the changing is based on the refining the bulk capacitance value. **BR** teaches that the changing is based on the refining the bulk capacitance value (CL6, L14-21), as the output voltage and the amount of filtering are set by the value of the bulk capacitance in relation to load current and the bulk capacitance decreases the voltage ripple (CL6, L16-21). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE** and **CH** with the method of **BR** that included the changing based on the refining the bulk capacitance value, as the output voltage and the amount of filtering would be set by the value of the bulk capacitance in relation to load current and the bulk capacitance would decrease the voltage ripple.

10. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Anderson et al. (AN)** (U.S. Patent 6,385,565) in view of **Peil (PE)** (U.S. Patent 4,806,937), **Brown (BR)** (U.S. Patent 5,960,207) and **Chan (CH)** (U.S. Patent 6,466,898), and further in view of **Chun (CHU)** ("investigation of voltage regulation stability of static synchronous compensator in power system", IEEE, January 2000).

10.1 As per Claim 14, **AN, PE, BR** and **CH** teach the method of claim 13. **AN, PE, BR** and **CH** do not expressly teach that the simulating the operation of the power distribution system

includes analyzing at least one transient response during the cyclical simulation. **CHU** teaches that the simulating the operation of the power distribution system includes analyzing at least one transient response during the cyclical simulation (Page 2643, Fig 4 and 5; Page 2644, Fig 6 and 9; Page 2644, CL1, Para 1; Page 2645, Fig 12 and 13), as the transient response indicates the speed of response as a function of time and transient gain (Page 2644, CL2, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE, BR** and **CH** with the method of **CHU** that included the simulating the operation of the power distribution system including analyzing at least one transient response during the cyclical simulation, as the transient response would indicate the speed of response as a function of time and transient gain.

10.2 As per Claim 15, **AN, PE, BR** and **CH** and **CHU** teach the system of claim 14. **AN, PE, BR** and **CH** do not expressly teach that the simulating the operation of the power distribution system includes analyzing the stability of the power distribution system. **CHU** teaches that the simulating the operation of the power distribution system includes analyzing the stability of the power distribution system (Page 2645, Fig 10; Page 2646, Fig 14 and 15; Page 2647, Fig 17; Page 2645,CL1, Para 1), as the power distribution system has resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage (Page 2645, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **AN, PE, BR** and **CH** with the method of **CHU** that included the simulating the operation of the power distribution system including analyzing the stability of the power distribution system, as the power distribution

system would have resonance characteristics and in systems with low resonant frequency the transient gain must be reduced to keep stability in the voltage.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to the Applicants' disclosure.

The following patents and papers are cited to further show the state of the art at the time of Applicants' invention with respect to simulating power distribution system with voltage regulator, switching mode regulator and SPICE model.

1. Buono, "Self oscillating switch mode DC to DC conversion with current switching threshold hysterisis", U.S. Patent 6,239,585, May 2001.
2. Skelton et al., "Hysteretic regulator and control method having switching frequency independent from output filter", U.S. Patent 6,147,478, November 2000.
3. Brooks et al., "Method and apparatus for programmable current sharing", U.S. Patent 6,292,378, September 2001.
4. Herrell et al., "Power surge management for high performance integrated circuit ", U.S. Patent 5,963,023, October 1999.
5. Vazquez et al., "An efficient single switch voltage regulator", IEEE, June 2000.

6. Smith, "Packaging and power distribution design considerations for a Sun Microsystems desktop workstation", IEEE, October 1997.
7. Bertacco et al., "Cycle based symbolic simulation of gate level synchronous circuits", IEEE 1999.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

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November 15, 2003

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